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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,578	10/07/2003	Tze-Liang Lee	TS01-787	5266

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EXAMINER	
TRINH, HOA B	
ART UNIT	**PAPER NUMBER**
2893	
MAIL DATE	**DELIVERY MODE**
10/15/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/680,578	**Applicant(s)** LEE ET AL.	
	Examiner HOA B. TRINH	**Art Unit** 2893	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 October 2007*.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24 and 49* is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-24, 49* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on *07 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *7/9/09*.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Claim Objections

1. Claim 5 is objected to because of the following informalities: In claim 5, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

2. Claim 6 is objected to because of the following informalities: In claim 6, lines 1-2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

3. Claim 8 is objected to because of the following informalities: In claim 8, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

4. Claim 11 is objected to because of the following informalities: In claim 11, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

5. Claim 12 is objected to because of the following informalities: In claim 12, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

6. Claim 17 is objected to because of the following informalities: In claim 17, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

7. Claim 18 is objected to because of the following informalities: In claim 18, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

8. Claim 24 is objected to because of the following informalities: In claim 24, line 2, "from a set:" should be "selected from a group consisting of". Appropriate correction is required.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

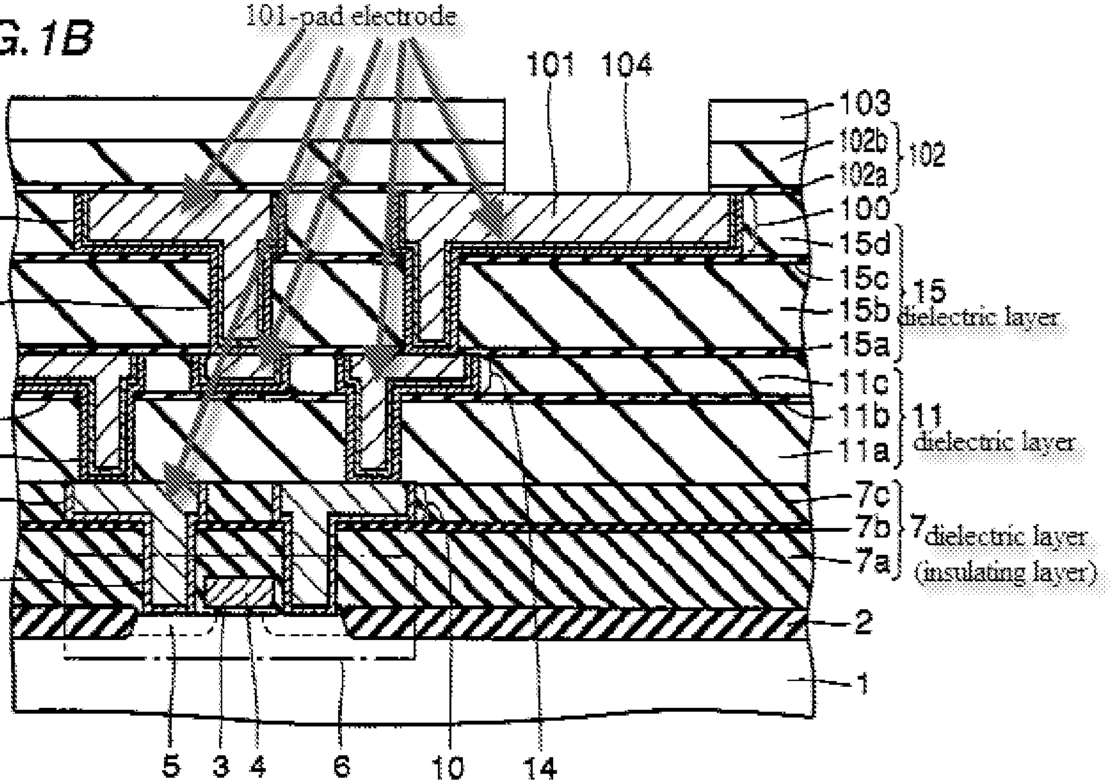
> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Harada et al. (2002/0005583; hereinafter as Harada).

Regarding claim 1, Harada discloses structure for corners of metallic features of semiconductor integrating circuits, comprising:

Comer angles of all comers of metallic features 101, imbedded in dielectric layers 7, 11, or 15, which are greater than 90 degrees (para. [0216], fig. 1A). Note that insulating layers are inherently dielectric layers in the art. (see marked-up figure 1b below)

FIG.1B



Regarding claim 2, said dielectric layer 7, 11 or 15 (fig. 1B) is composed of materials from the set: silicon oxide, silicon nitride (para. [0010], [0014], [0209).

Regarding claim 3, said dielectric layer 7, 11 or 15 (fig. 1B) is a composite of dielectric layers. For example, the dielectric layer 7 has a dielectric layer 7a and a dielectric layer 7c.

Regarding claim 4, said dielectric layer 7, 11, or 15 is inherently a low-K dielectric material.

Regarding claim 5, said metallic feature 101 is composed of Cu (para. [0208], lines 20-21).

Regarding claim 6, said metallic feature 101 is a trench, pad or a via (fig. 1B).

Regarding claim 7, Harada discloses a structure for comers of metallic features of semiconductor integrating circuits, comprising:

Comers of all metallic features 101, imbedded in dielectric layers 7, 11 or 15, which are formed in n-fold clipped corner configurations (fig. 1A), with n being greater than 0.

Regarding claim 8, said dielectric layer 7, 11, or 15 (fig. 1B) is composed of materials from the set: silicon oxide, silicon nitride (para. [0010], [0014], [0209).

Regarding claim 9, said dielectric layer 7, 11, or 15 (fig. 1B) is a composite of dielectric layers.

Regarding claim 10, said dielectric layer 7, 11, or 15 is inherently a low-K dielectric material.

Regarding claim 11, said metallic feature 101 (fig. 1B) is composed of materials from the Cu (para. [0208], lines 20-21).

Regarding claim 12, said metallic feature 101 (fig. 1B) is a via, trench, or pad.

Regarding claim 13, said n-fold clipped comer configurations of comers of metallic features 101 (fig. 1A) of a level are n-fold equal angle clipped comer configurations, with n equal or greater than one, when said dielectric layer 7, 11 or 15 of said level is composed of an inherent low-K dielectric material and no CMP step is done on said level. Note that "no CMP step is done on said level" is a product-by-process limitation. The final result of the product is the same regardless of any step in the product claim.

Regarding claim 14, said n-fold clipped comer configurations of comers of metallic features 101 (fig. 1B) of a level are n-fold equal angle clipped comer configurations, with n equal or greater than 2, when said dielectric layer 7, 11 or 15 of said level is composed of an inherent low-K dielectric material and said level has a structural characteristic resulting from a CMP step. Note that "…from a CMP step" is a product-by-process limitation. The final result of the product is the same regardless of any step in the product claim.

Regarding claim 15, said n-fold clipped corner configurations of comers of metallic features 101 (fig. 1B) of a level are n-fold equal angle clipped corner configurations, with n equal or greater than one, when said dielectric layer 7, 11, or 15 of said level is composed of a material of silicon oxide, silicon nitride (para. [0010], [0014], [0209) and said level has a structural characteristic resulting from a CMP step. Note that "…from a CMP step" is a product-by-process limitation. The final result of the product is the same regardless of any step in the product claim.

Regarding claim 16, Harada discloses a structure for metallic features of semiconductor integrating circuits, comprising:

shapes of all metallic features 101 (fig. 1B) imbedded in dielectric layers 7, 11, or 15, that could be formed as squares, are instead configured as m-sided regular polygons, where m is greater than 4 (fig. 1A).

Regarding claim 17, said dielectric layer 7, 11, or 15 (fig. 1B) is composed of materials from the set: silicon oxide, silicon nitride, silicon oxynitride, PSG, BPSG (para. [0010], [0014], [0209).

Regarding claim 18, said dielectric layer 7, 11 or 15 (fig. 1B) is a composite of dielectric layers.

Regarding claim 19, said dielectric layer 7, 11 or 15 (fig. 1B) is inherently a low-K dielectric material.

Regarding claim 20, said metallic feature 101 (fig. 1B) is composed of materials from the set: doped polysilicon, metal silicides, A1, Cu, W (para. [0208], lines 20-21).

Regarding claim 21, said metallic feature 101 (fig. 1B) is a pad.

Regarding claim 22, m of said m-sided regular polygon (fig. 1A) is at least equal to 8 when said metallic features 101 are on a level where said dielectric layer 7, 11, or 15 is composed of an inherent low-K dielectric material and no CMP step is done on said level. Note that "…from a CMP step" is a product-by-process limitation. The final result of the product is the same regardless of any step in the product claim.

Regarding claim 23,m of said m-sided regular polygon (fig. 1A) is at least equal to 16 when said metallic features 101 (fig. 1B; note that the sides of at least 2 polygon (8 sides) metal features are added up to be at least 16) are on a level where said dielectric layer 7, 11 or 15 is composed of an inherent low-K dielectric material and said level has a structural characteristic resulting from a CMP step. . Note that "…from a CMP step" is a product-by-process limitation. The final result of the product is the same regardless of any step in the product claim.

Regarding claim 24, m of said m-sided regular polygon (fig. 1A) is at least equal to 8 when said metallic features 101 (figs 1A, 1B) are on a level where said dielectric layer 7, 11 or 15 is composed of a material of the set: silicon oxide, silicon nitride (para. [0010], [0014], [0209) and said level has a structural characteristic resulting from a CMP step. Note that "…from a CMP step" is a product-by-process limitation. The final result of the product is the same regardless of any step in the product claim.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harada in view of Kirchhoff (2002/0022339)

Regarding claim 49, Harada discloses an apparatus comprising a semiconductor chip (para. [0208]) that includes: a low-k dielectric film 7, 11 or 15 (fig. 1B); and a metal pad 101 (fig. 1B; see marked-up above) embedded in said low-k dielectric film 7, 11 or 15 , said metal pad 101 having comer angles which are greater than 90 degrees (fig. 1A; para [0216]).

However, Harada does not disclose that the low-k dielectric film has a dielectric constant less than about 3.0.

Kirchhoff discloses an analogous device having metal features 2, 3 embedded in a dielectric film (porous silicon oxide) 6 (fig. 2) which has a dielectric constant of 1.1-4 (para. [0007], lines 5-6) for improving capacitive coupling (para. [0004], line 9).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the dielectric layer of Harada with porous silicon oxide material, as taught by Kirchhoff, for the advantage as mentioned in the above.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Vikki Trinh whose telephone number is (571) 272-1719. The Examiner can normally be reached from Monday-Friday, 9:00 AM - 5:30 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Davienne Monbleau, can be reached at (571) 272-1945. The office fax number is 703-872-9306.

Any request for information regarding to the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Also, status information for published applications may be obtained from either Private PAIR or Public Pair. In addition, status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. If you have questions pertaining to the Private PAIR system, please contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

Lastly, paper copies of cited U.S. patents and U.S. patent application publications will cease to be mailed to applicants with Office actions as of June 2004. Paper copies of foreign patents and non-patent literature will continue to be included with office actions. These cited U.S. patents and patent application publications are available for download via the Office's

PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site (www.uspto.gov), from the Office of Public Records and from commercial sources. Applicants are referred to the Electronic Business Center (EBC) at http://www.uspto.gov/ebc/index.html or 1-866-217-9197 for information on this policy. Requests to restart a period for response due to a missing U.S. patent or patent application publications will not be granted.

/(Vikki) Hoa B Trinh/
Examiner, Art Unit 2814

/Davienne Monbleau/
Supervisory Patent Examiner, Art Unit 2893